

**MEMORANDUM****State of Alaska**

Department of Transportation & Public Facilities  
Design and Engineering Services – Southeast Region  
Preconstruction / Design

TO: Charlie Deinenger  
Chief Contracts Officer

DATE: November 20, 2015

THRU: *MC* Mike J. Coffey *WC*  
Regional Director

TELEPHONE NO: 465-1215

THRU Vanda Randolph *VR*  
SE Region Contracts Officer

FAX NUMBER: 465-4414

FROM: Charles Tripp, P.E. *CT*  
Engineering Manager *for*

SUBJECT: 69534-Water Street Bridge No.2  
Approval to specify proprietary  
products for consistency

We are preparing plans and specifications to replace the Water Street Bridge No. 2.(Bridge Number 0446). This project will involve the construction of new telecommunications, electrical, water system and storm drain system products owned by Ketchikan Public Utilities (KPU).

We intend to specify proprietary telecommunications, electrical, water system and storm drain inlet products (see attached list) that are routinely used in the maintenance of KPU's systems and essential for its operation to avoid potentially introducing additional product types into their system.

A Public Interest Finding was prepared that outlines the reasons to specify these proprietary products specifically without an accompanying 'or approved equal' clause.

As outlined in the Public Interest Finding, were this utility work is being carried out under a Utility Agreement as is usually the case, the specification of proprietary products would be exempted from seeking a Public Interest Finding. Since this work is essentially the same as work normally carried out under a Utility Agreement in which case no Public Interest Finding would be required, the specification of proprietary products should be approved.

By signing below, the parties agree that the use of the specified telecommunications, electrical, water system and storm drain system proprietary products as part of the bridge replacement contract is in the State's best interest.

Recommended:

*for* *Chuck Coffey* *11/20/15*  
Michael J. Coffey, Regional Director Date

Approved:

*Charlie Deininger* *11/23/15*  
Charlie Deininger, Chief Contracts Officer Date

**PUBLIC INTEREST FINDING**  
**69534 KTN BR-000S(735) KTN Rehabilitation/Replacement of Off System City**  
**Bridges Water Street Trestle No. 2 (Bridge No. 0446)**  
**Ketchikan, Alaska**

Introduction

The Department of Transportation & Public Facilities intends to specify proprietary electrical, telecommunications, water system and storm system products listed below on the 69534 KTN Rehabilitation/Replacement of Off System City Bridges Water Street Trestle No. 2 (Bridge No. 0446) Project.

Purpose:

The Alaska Department of Transportation and Public Facilities (ADOT&PF) is preparing to replace the Water Street Bridge (Bridge No. 0446) in Ketchikan. This work requires that electrical, telecommunications, water and storm utilities owned by Ketchikan Public Utilities (KPU) to be replaced. ADOT&PF intends to specify the proprietary products listed below in the contract to relocate those utilities.

As part of eligible Utility Relocations, 23 CFR 645.117 allows the use of proprietary products that are routinely used in the maintenance of a Utility's system and essential for its operation.

If the work under this contract were being carried out under a Utility Agreement, no Public Interest Finding would be required. According to Policy and Procedure 10.02.013, a P.I.F. is not required when "a utility agreement is being established and there are minor quantities of materials and supplied and proprietary products that are routinely used in a Utility's operation which are essential for the maintenance of the system (23 CFR 645.117(e)).

It is not in the best interest of KPU to allow the use of non-proprietary products for this contract because this would introduce products into KPU's systems for which KPU would then have to maintain an inventory of replacement parts in order to maintain system reliability. In order to maintain system reliability, utilities generally maintain inventories of replacement parts in sufficient quantities to respond quickly to equipment failures. Utilities try to minimize the number of product types in their systems in order to minimize the inventories of parts necessary to maintain system reliability.

This project is being initiated by ADOT&PF, not KPU, in order to proceed with the ADOT&PF project to replacement the Water Street Bridge (Bridge No. 0446). The use of proprietary products is necessary in order to minimize inconvenience to KPU's operations.

Add the following Section:

## **SECTION 662**

### **POWER DISTRIBUTION SYSTEMS**

**662-1.01 DESCRIPTION.** This specification describes the construction requirements for overhead power lines. The work includes furnishing and installing, modifying, removing or salvaging electrical utility mainline transmission poles, tap poles, service poles, guy poles, crossarms, insulators, conductors and hardware.

**662-1.02 PLANS, SPECIFICATIONS AND CONSTRUCTION DRAWINGS.** The scope of the work is described in detail as shown on the plans and specifications, specifically, the U and V sheet plans, 662 and 663 specifications, and Appendix E (KPU Pole Construction Drawings, KPU Fire Resistive Clothing and KPU Switching & Clearance Policy) for the project:

#### **KPU Construction Drawings in Appendix E:**

<b>DRAWING</b>	<b>TITLE</b>
C7, 7-1	7.2/12.5 kV Three Phase Crossarm Construction, Deadend (Single)
C8	7.2/12.5 kV Three Phase Crossarm Construction, Deadend (Double)
C8-2	7.2/12.5 kV Three Phase Crossarm Construction, Deadend (Double)
C8-11	7.2/12.5 kV, Three Phase Crossarm Construction, Deadend (Double)
E1-2, E1-2TEL	Grounded Down Guy Assemblies
E1-2A,C	Insulated Down Guy Assemblies
E2-2, E2-2TEL	Grounded Overhead Guy Assemblies
E2-2A,C	Insulated Overhead Guy Assemblies
E3-10	Guy Guards
F2	Cross Plate Anchor Assembly
F3.16-3.36	Plate Anchor Assemblies
G39	7.2/12/5 kV Single Phase Transformer on Three Phase Circuit
J5-16	Secondary Assemblies
K5-15	Service Assemblies
M2-11	Grounding Assembly, Ground Rod Type
M2-12	Grounding Assembly, Pole Butt Type
M5-1 to 5-8	7.2/12.5 kV Miscellaneous Primary Assemblies
M5-1 to 5-5	34.5 kV Miscellaneous Primary Assemblies
M5-9, M5-16	7.2/12.5 kV Miscellaneous Primary Assemblies
VC1	34.5 kV, Three Phase Crossarm Construction, 0-2 degrees Angle (Large Conductors)

LOCATION: KTN – Water Street: Rehabilitation / Replacement of Off System City Bridges  
Federal Project No: BR-000S(735)

AKSAS Project No: 69534

VC1-R	34.5 kV, Three Phase Crossarm Construction, 0-2 degrees Angle (Large Conductors), Raptor Type
VC1-2R	34.5 kV, Three Phase Crossarm Construction, 0-2 degrees Angle (Large Conductors), Raptor Type
VC2	34.5 kV, Three Phase Crossarm Construction, Double Support, (Large Conductors)
VC2-R	34.5 kV, Three Phase Crossarm Construction, Double Support (Large Conductors), Raptor Type
VC7-1	34.5 kV, Three Phase Crossarm Construction, Deadend (Single)
VC8	34.5 kV, Three Phase Crossarm Construction, Deadend (Double)
VC8-R	34.5 kV Three Phase Crossarm Construction, Deadend (Double), Raptor Type
T-1	Double Communication Crossarm Assembly
T-11	Double Communication Crossarm Assembly, Alley Arm Type

The work includes furnishing of all labor, materials, supervision, tools, equipment and permits required to install the specified power and telephone facilities. It is not the intent of these Plans and Specifications to show all details of design and construction. The Contractor shall be responsible to provide materials and workmanship that conforms to **KPU Standards** and is suitable for the specified service.

The drawings and specification reflect the field conditions as of August 10, 2015. At that time there was ongoing work being done on the Water Street Bridge Advance Utility Relocation project. Field confirm the existing conditions.

The Contractor shall keep a redlined set of complete "record copy" plans and specifications. These plans shall record all construction assemblies and correct any changes/discrepancies. Three copies of record copy plans shall be furnished to the Engineer following completion of the work.

**662-1.03 RELATED WORK.** The Contractor shall install telecommunication cabling and equipment, remove the pole P10T and guying specified on the V Sheets for the telecommunication facilities, Specification 663, and as shown on the U sheets.

**662-1.04 REGULATIONS AND CODES.** All construction work shall be done in a thorough and workmanlike manner in accordance with the Plans, Specifications and Appendix E KPU Construction Assembly Drawings/Pole Typicals and Assemblies Manual (See Appendix E). Construction work shall comply with latest editions of National Electrical Safety Code (NESC), National Electric Code, and Alaska Safety Code. Where local regulations are more stringent, local regulations shall govern.

The Contractor and craftsmen shall have the appropriate licenses and certifications required by the State of Alaska for outside electrical line construction, including the proper certifications for qualified persons. Furthermore, all construction work shall conform to State and Federal (OSHA) safety requirements; The installation shall meet NEMA and UL standards.

**662-1.05 LOCATION OF STRUCTURES.** In general, the existing overhead distribution wood poles along Water Street will remain. New guys/anchors shall be placed at the locations shown on the U and V

Sheets for the project. Furthermore, guys/anchors shall be installed at existing grade. Structures shall not be erected in any other location without prior approval of the Engineer.

The Contractor shall examine the Plans and Specifications and shall notify the Engineer of any discrepancies or conflicts in pole or anchor locations that are evident before proceeding with the work. Furthermore, the Contractor shall verify the location of proposed electrical facilities with respect to other civil or mechanical facilities that may interfere with the installation.

**662-1.06 SERVICE INTERRUPTIONS AND SWITCHING.** Energized line work will be required to minimize service interruptions to KPU consumers. No consumer shall be placed out of service without the advance permission of KPU. Consumers shall be exposed to a minimum number of outages and those outages shall be limited to the transfer from one energized facility to another energized facility. After specific approval for an outage has been obtained from KPU, the Contractor shall notify all affected consumers individually.

The Contractor shall submit a service interruption plan to KPU prior to commencing the work to demonstrate how the work will be accomplished with minimum interruptions in service. Furthermore, the plan shall establish switching procedures for the project's subtransmission and distribution circuits for the safety and protection of workers and the integrity of the KPU system. Final approval of the plan must be obtained from KPU and the DOT.

Contact information for the utilities:

KPU Electric	Mark Adams, 907 225 5505 Jeff Harrison, 907 225 5505
KPU Telecommunications	Raul Moje, 907 228 5465
GCI	Randy Laird, 907 230 1182 Buzz Hasson, 907 220 7111
KPU Water	John Stensland, 907 225 3543; 228 5499
Ketchikan Public Works	Seth Brakke, 907 228 4725

**662-1.07 SCHEDULING OF WORK.** The electrical work shall be sequenced with the bridge construction and communications work to minimize delays. The Contractor shall provide a work schedule for approval that is acceptable to the Department and the affected utilities. The Contractor shall be responsible for the coordination of his activities with the activities of other contractors and the utilities.

Prior to start of construction the Contractor shall schedule a meeting with the appropriate personnel from the DOT, GCI, KPU-Telephone, Electric, and Water. The meeting topics shall include discussing the following:

- A. Project Schedule:
- B. Water Street:

Bridge shoring – confirm with the City that the bridge's posted weight restrictions (50,000 pounds) pose no issues with the construction work along Water Street.

Coordination with the bridge deck fabricator to install inserts in the bridge deck for mounting electrical and telecommunications equipment, including the conduits racks.

Coordination to fabricate mounting brackets for KPU-T and GCI pedestals.

Coordination to install grounding electrode conductor to the rebar in the column footings at each of the four utility pads.

Sequence for installing new under bridge distribution systems, and demolition of overhead infrastructure

Methods of handling the service installation to the homes including discussions with the owner regarding equipment location, installation methods and routes; define the anticipated number of outages and their length for electrical and telecommunications. In relation to the contractor's work to install fiber to the home, discuss scheduling the work involved with KPU-T programming efforts to switchover the fiber service in the project work area from their Main central office to the Downtown central office.

At the base of Parnell Stairs: Installation of new Pole P10; removing existing poles P10 and P10T; refeeding the Parnell VDSL cabinet installation; excavation around Manhole 18; including avoiding the existing underground infrastructure/coordinating with new conduit installation; shoring and trench safety procedures.

KPU lockout and tagout procedures and contacting KPU dispatch for the duration of the project

Loss of parking places due to construction equipment

**662-1.08 TEMPORARY OR INCIDENTAL CONSTRUCTION.** The Contractor shall provide any temporary or incidental construction necessary to complete the work in a timely manner in accordance with the approved work schedule. If the line work precedes the road excavation work, the Contractor shall excavate pole sites to final grade where cuts will be made and extend anchor rods in fill areas. Furthermore, some excavation work may be required to maintain adequate clearances under the line until the road excavation is complete.

If required, the Contractor shall assist other contractors with the relocation of facilities, either temporarily or permanently, on an as needed basis.

**662-1.09 EASEMENTS.** All planned electrical facilities are located within established Department rights-of-way or KPU easements. The status of KPU easements outside the right-of-way should be verified. Construction activities shall be limited to within the easement boundaries or the Department's rights-of-way. Furthermore, only activities specified in the terms of the easement shall be permitted and the Contractor shall restore the property to the original condition, where possible, or as directed by the the Engineer.

**662-1.10 SURPLUS MATERIAL.** Surplus material in good condition that can be salvaged from the old line may be reused if approved by the utility. Surplus material in good condition shall be reasonably protected and returned to the utility if not reused. This material includes transformers and metal parts including conductors. Surplus material of no value shall be removed from the right-of-way by the Contractor and discarded in an approved landfill. Disposal or return of surplus material shall be incidental to the power line relocation.

**662-2.01 MATERIALS.** The Contractor shall furnish all materials unless otherwise noted. All products shall be new and currently produced by reputable manufacturers approved by KPU. Similar products shall be standardized to the extent possible and replacement parts shall be readily available within the industry. Surplus materials in good condition may be reused if approved by KPU. KPU may have selected materials available for purchase by the Contractor.



Coordinate with the number of submittals required. Label each book with Project Name and Designation Number, and Contractor's Name and include the subsections 2.02 thru 2.17. Submittals shall include manufacturer, model number, catalog cuts, operating instructions, spare part numbers and local distributors of each part.

All materials for which testing standards have been established within the industry shall be tested to said standards. The KPU Electric Construction Standards in Appendix E establish the standard of quality and performance through brand names and catalog numbers. These products shall be provided to facilitate warehousing and replacement and any substitutions must be approved by the utility.

The Contractor also shall comply with the requirements of 23 CFR 635.410, Buy America Requirements, and shall submit a completed Material Origin Certificate, Form 25D-60, prior to award of the contract.

**662-2.02 POLES.** Wood poles shall be full length pressure treated Douglas Fir. The height and class of each pole shall conform to the Pole Information Sheet. ..

The wood poles furnished for the project shall meet or exceed the requirements of the latest edition of ANSI 05.1-Specifications and Dimensions for Wood Poles. All poles shall be cut from live Pacific Coast Douglas Fir timber and shall be air seasoned prior to treatment until the moisture content is less than 30%. The pole circumference for the specified length and class shall not be less than the minimum circumferences listed in ANSI 05.1 for Douglas Fir at the pole top and six feet from the butt. Average rate of growth measured at the butt shall not be less than six rings per inch. Poles shall conform to ANSI 05.1 requirements for prohibited and limited defects. In addition, checks greater than 5/8" after treatment, large sucker, spike and ring knots, or spiral grain exceeding 1/2 twist in any 15 feet of length will not be permitted.

All poles shall be machine peeled and all bark removed in accordance with ANSI 05.1. The top and butt of each pole shall be accurately sawed to provide a square cut prior to treatment. The face of each pole shall be permanently marked with a 2" aluminum disk, recessed 1/4" into the pole and a uniform distance from the butt. The Douglas Fir poles shall be incised 1/2 inch minimum depth for the entire length of the pole prior to treatment. Structure holes shall not be predrilled by the pole supplier.

The Douglas Fir poles shall be full length pressure treated with an oil-borne 5 percent (minimum) solution of pentachlorophenol, using an empty cell process in accordance with American Wood Preservers Association (AWPA) Standards C1 and C4, latest revisions. The preservative shall be a pentachlorophenol petroleum solution meeting the requirements of the latest edition of AWP Standards P8 and P9. Penetration shall be in accordance AWP Standards and shall be a minimum depth of 0.75" in the sapwood.

The pole supplier shall perform all tests required by AWP Standards. Poles shall be independently inspected prior to shipment and a copy of the report shall be furnished to KPU.

Wood pole caps shall be plastic, sized per top diameter of pole; KPU standard caps are 9.5 and 12 inch diameter Kapco Enterprise Pole Cap-9 and Pole Cap 12 or equal.

Freestanding pole shall be an unguyed, self-supporting metal pole, direct embedded with ground sleeve to replace an existing pole P10 a 70 foot, Class 2 wood pole. The pole shall be made of weathering steel, ASTM A572 or A871 material with 65ksi minimum yield strength, two section with telescoping joint construction, and pole cap.

Free standing pole shall be complete with grounding provisions meeting NESC requirements; factory drilled holes; crossarms and brackets to accommodate crossarms, riser conduits, anchor bolts, and grounding terminations. Design and manufacture shall be by Trinity Meyer, Valmont, Union Metal or equal and shall meet RUS Bulletin 1724E-204 Guide Specification for Single Steel Pole and H-Frame Structures. Coordinate with the manufacturer the mounting requirements for the hardware such as solid blade disconnects with the crossarms. Submittal information shall include the following information: design calculations, drawings showing pole length, layout, projections, ASTM number and grade, shaft thickness, crossarms, fastening methods and hardware including anchor bolts, bolt sizes, and shipping weight.

**662-2.03 WOOD CROSSARMS.** Wood crossarms shall be full length pressure treated solid sawn Douglas Fir timbers. The cross sectional dimensions and length of each crossarm shall conform to the KPU Construction Drawings.

All wood crossarms furnished for the project shall conform to the requirements of ANSI Standards 05.2 and 05.3 and RUS Specification 1728H-701. All crossarms shall be made from live Pacific Coast Douglas Fir. Timbers shall conform to the provision of Select Structural as described in the Standard Grading Rules for West Coast Lumber. The quality of the wood crossarms shall meet or exceed the requirements of RUS 1728H-701 and shall be free of brashy wood, cracks, decay and insect holes. Furthermore, only sound, firm and tight knots will be permitted if well spaced. Crossarms shall be predrilled prior to treatment for the structure configurations in the KPU Construction Drawings. Also, the crossarms shall be incised to improve treatment penetration.

The Douglas Fir crossarms shall be pressure treated with oil borne pentachlorophenol in accordance with AWP Standard C25-92 (Solid Sawn) or C28-91 (Glue Laminated). The retention level of pentachlorophenol shall not be less than 0.4 pounds per cubic foot. Furthermore, the penetration shall not be less than 3 inches from the end surfaces and from any pin or bolt hole and at least 3/16" from the surface of any face for Douglas Fir heartwood.

All crossarms shall be branded legibly with at least 1/2" letters at a depth of approximately 1/16" before treatment. Crossarms shall be bundled and protected from damage during shipment.

**662-2.04 OVERHEAD CONDUCTORS.** The overhead conductors for the 12.5 kV distribution circuits shall be 4/0 AWG 6/1 ACSR "Penguin" for circuits using aluminum conductor and 4/0 AWG 7/1 copper weatherproof line wire for circuits using copper conductor; ACSR shall use standard weight galvanized steel cores. The neutral conductor shall be 4/0 ACSR and tap conductors shall be sized to match the circuit being tapped with a minimum size of #2. The conductors shall be designed and manufactured in accordance with ASTM B232- Aluminum Conductors, Concentric-Lay-Stranded Steel Reinforced and ASTM B498- Zinc Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR).

Conductors shall be uniformly cylindrical, clean and free from excessive grease and shall have a smooth surface. The make up and lay of the wires shall produce an overall conductor free from a tendency to untwist or spring apart when cut. Conductors shall be furnished on reels of sufficient length to minimize the need for splicing. Conductors shall be installed in accordance with ANSI/IEEE 524-IEEE Guide to the Installation of Overhead Transmission Line Conductors.

Overhead 120/240 volt, single phase circuiting shall match existing KPU circuiting, #4/0 aluminum minimum size, Triplex, rated 600 volt.



**662-2.05 INSULATORS.** The standard insulators used by KPU for 34.5 kV and 12.5 kV circuits with large conductors shall be furnished for the project. These insulators are:

35 kV Pin Insulator

Manufacturer:	Hendrix
Type:	Vise Top Model:
Model:	HPI-35VT
Material:	Polyethylene
ANSI Class:	55-6
60 HZ Dry Flashover:	110kV 60 HZ
60 HZ Wet Flashover:	63 kV
Leakage Distance:	21"
Pin:	1 3/8" x 8"

35 kV Deadend Insulator

Manufacturer:	MacLean
Model:	DS-35M
Material:	Silicone Rubber
ANSI Class:	C1-3, C1-4
60 HZ Dry Flashover:	170 kV
60 HZ Wet Flashover:	155 kV
Leakage Distance:	37.6"

15 kV Pin Insulator

Manufacturer:	Hendrix
Type:	Vise Top
Model:	HPI-15VT
Material:	Polyethylene
ANSI Class:	55-3
60 HZ Dry Flashover:	77 kV
60 HZ Wet Flashover:	46 kV
Leakage Distance:	12"
Pin:	1" x 6"

15 kV Deadend Insulator

Manufacturer:	MacLean
Model:	DS-15M
Material:	Silicone Rubber
ANSI Class:	C1-2
60 HZ Dry Flashover:	90 kV
60 HZ Wet Flashover:	65 kV
Leakage Distance:	15.8"

The type of insulator to be used on each structure is provided in the list of materials on the KPU Construction Drawings. Insulators shall conform to the requirements of ANSI C29.11-1996 and C29.13-2000 for composite materials.

**662-2.06 HARDWARE.** All line hardware furnished shall be hot dipped galvanized with an ultimate strength at least twice the design rating. Line hardware shall comply with the latest applicable sections of the following ASTM and ANSI Standards: ASTM A123, ASTM A153, ATSM A220, ATSM A307, ASTM A 449, ASTM A546, ANSI B18 and ANSI C135. Bolts shall be readily removable after fittings have been loaded to 50 per cent of the ultimate strength.

LOCATION: KTN – Water Street: Rehabilitation / Replacement of Off System City Bridges

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AKSAS Project No: 69534

The Contractor shall furnish the line materials specified in the list of materials on the KPU Construction Drawings. If a specific manufacturer reference is not provided in the list of materials on the KPU Construction Drawings, line material shall all meet the requirements of materials approved by the Rural Utilities Service (RUS). In addition, the following equipment is KPU standard hardware items:

1. Hot clamp shall be 35kV rating, self-cleaning wedge design made with 6061-T6 aluminum meeting or exceed ANSI C119.4 Class A specifications, suitable for aluminum or copper conductors with main and tap sizes of 3/7 to 1/0, anodized screws and bolts, hot clamp operable, Utilco Power Grip SCH-397 or equal.
2. Overhead inline splices for ACSR conductors shall be suitable for conductors sized 266.8 thru 336.4 (18/1), 10,000 pound tension rating, Blackburn Autoset Splice ATS 266366 or equal.
3. Overhead inline splices for copper conductors shall be suitable for conductors sized 4/0 stranded copper, Fargo 407 or equal.
4. Overhead inline splices for ACSR conductors shall be full tension, suitable for conductors sized 2 stranded, Burndy HySplice YDS2RLY or equal.
5. Overhead inline splices for triplex and overhead service drops shall be suitable for copper or aluminum conductors sized 2 or 1 stranded, Burndy Insulink ES2R2R or equal.

**662-2.07 GUYS AND ANCHORS.** Unless otherwise specified, guy strand shall be 16 M (7 No. 8) Alumoweld with a 16000 lb. breaking strength. The aluminum clad steel strand shall conform to the requirements of ASTM B415 and B416. Guy strain insulators as specified in the KPU Construction Drawings must be installed in all power guys attached to poles carrying energized conductors.

Two types of anchors shall be furnished for the guying the main line. Where the subsurface conditions are predominately solid rock, KPU approved rock anchors shall be installed. These anchors must be securely grouted in at least 10 feet of solid rock. The diameter of the drilled hole shall be as shown on the KPU Construction Drawing. The hole shall be cleaned before grouting and only the grout recommended by the Manufacturer shall be used.

Anchors shall be tested for 24 hours at full design tension after the grout has cured. The Contractor shall reset any anchors that indicate creep or withdrawal for any reason when placed under strain to the satisfaction of the Engineer.

Where the subsurface conditions are predominately soil or fractured rock, large capacity plate anchors shall be installed as shown in the KPU Construction Drawings. These anchors shall be placed in line with the guy so that most of the anchor plate will pull against undisturbed earth. In locations with largely organic material, crushed rock shall be used for backfill instead of the native material. Backfill shall be compacted to 90% of the surrounding material.

The subsurface conditions along the North Tongass Highway are difficult to predict so the anchor types shown in the staking sheets were estimated. The Contractor shall make the final selection of the type of anchor with the concurrence of the Engineer when the site is excavated.

**662-2.08 DISTRIBUTION TRANSFORMERS.** All transformers shall meet KPU specification requirements.

The single phase, padmounted distribution transformers used on the project shall have the following ratings:

Type:	Conventional (External fuse)
Primary Voltage:	7200 V
Secondary Voltage:	120/240 V
Capacity:	10-167 kV
Winding Temperature Rise:	65 degrees C
Insulation:	Mineral Oil
BIL:	95 kV
Taps:	Two 2.5% plus or minus
Connection	Loop in and loop out
Mounting	Residential Padmount
Specifics	Stainless steel housing and mounting hardware; 2-position, load break rated on/off switch
Basis of Design	Cooper Systems Shrubline

All padmounted transformers shall have stainless steel sill, door and hardware meet the requirements of ANSI C57.12.20-1997, and all other components of the transformer assembly shall be furnished by the Contractor. Padmounts shall be deadfront, loop feed, single phase, meet the KPU Transformer specification requirements listed in Appendix E, Cooper Shrubline or equal. During the submittal phase, the contractor shall confirm that the transformers being provided will fit in the locations shown on plan with the proper clearances per NESC, NEC and manufacturer's installation requirements. The overhead distribution transformers (single phase) in the work areas shall be removed and returned to KPU by the Contractor after the new distribution system is energized and accepted.

Pole mounted transformers shall have same characteristics as listed above and shall be RUS approved. Provide pole mounting hardware as required for a complete installation.

**662-2.09 COMMUNICATIONS GUYING AND STRAND.** The Contractor shall furnish and install the communication guys indicated on the plans. Unless otherwise specified, 16M (7 No 8) Alumoweld guy strand with a 16,000 lb. breaking strength shall be provided. Communications guys shall be attached to the power anchors in a similar manner as the power guys and properly tensioned. All communications guys shall be grounded unless otherwise directed by KPU.

**662-2.10 HIGH VOLTAGE CABLE TERMINATIONS.** Cable termination kits shall be installed at the riser poles and in the high voltage pull boxes. Terminations shall meet IEEE Standard 386 interface, 15kV, 200 amp loadbreak, EPDM insulation.

Jacket seals for terminations shall be suitable for jacketed concentric neutral cable, an EPDM cold shrink splice tube and rubber base mastic, 15kV, 3M Cold Shrink Cable Accessory Sealing 8450 series or equal. Install seals on each end of the cable termination jacket.

Cable terminations for the underground 12.47kV and 7.2kV circuits at the riser poles shall have a cold shrink splice body, meet IEEE 404, suitable for outdoor termination of jacketed concentric neutral cable (as specified), complete with non-tracking tube, sealants, stress gradient mastic. See drawings for manufacturer and part number.

**662-2.11 HIGH VOLTAGE EQUIPMENT CONNECTIONS.** High voltage equipment connections shall be as follows:

1. **LOADBREAK ELBOWS.** Loadbreak elbows shall be suitable for terminating concentric neutral cable, 15kV, 200 amp loadbreak, 95kV BIL, jacket made with EPDM rubber insulation. Elbow shall mate with the padmount transformer connection requirements and meet IEEE Standard 386 interface standard, Cooper, Elastimold or equal.
2. **SOLID BLADE DISCONNECT SWITCH.** Disconnect switch shall be branch feeder type, 15kV pole mounted on crossarm, IEEE Standard 386 interface, 600 amp loadbreak, 110kV BIL, complete with all necessary mounting hardware including backup member and compression connectors with stainless steel bolts and pad, S&C Loadbuster (see sheet U44 for additional info) or equal.
3. **FUSED CUTOUPS.** Fused cutouts shall be open type, 15kV, 100 amp, 95kV BIL, with porcelain body, fuseholder tube on disconnect arm and fuse link (coordinate size with KPU), complete with hardware for mounting on freestanding pole crossarm, MacLean, S&C or equal.

**662-2.12 HIGH VOLTAGE CABLE.** High voltage cable shall be 15kV, copper, MV105 power cables (105C continuous operating temperature; 133% insulation level) with concentric neutral - bare copper wires (full neutral for single phase circuits, 1/3 neutral for three phase circuits), compressed round copper conductor, 220 mils EPR insulation, EPR conductor and insulation screens, and PE overall encapsulating outer jacket, Okonite URO-J, Kerite, Southwire, General Cable or equal. Provide copies of the final factory-test voltages, cable manufacturer's installation guide, including pull calculations, and testing procedures in the submittals.

**662-2.13 600 VOLT CONDUCTORS.** All wire and cable shall meet the specifications of the NEC and ICEA. Branch, feeder and service circuit conductors shall be copper. No. 8 AWG conductors and larger shall be stranded. Minimum branch circuit conductor size shall be No. 12 AWG. All wire shall be sized for voltage drop. All branch circuit runs shall have a ground wire pulled for the entire circuit and connected at each device/box. Branch, feeder and service circuit insulation shall be 600 volt with the following insulation types.

- a. Service laterals in conduit: Type XHHW copper or Triplex UD aluminum. Conductor size shall at a minimum match the existing service conductor ampacity, but in no case be less than #2 AWG.
- b. Branch circuit and feeders in conduit: XHHW
- c. Bare copper for bonding and grounding electrode conductors at service entrances.
- d. Green insulated for branch and feeder circuit equipment grounding conductors

**662-2.14 RACEWAYS.** The type of conduit to be installed at various locations shall be as shown on the drawings. Raceways shall be as follows:

1. Feeders: outdoors and underground: PVC Schedule 80 conduit or rigid steel conduit
2. Telephone and cable TV systems: PVC Schedule 80 conduit
3. On riser poles - sweep bends and 1st stick on the pole: Rigid Steel Conduit (RSC)
4. Heat tape cable: PEX or HDPE
5. Final 18" connection to equipment where vibration is possible- Liquidtight Flexible Metal Conduit complete with grounding liquidtight connection.

Rigid non-metallic conduits shall be PVC, schedule 80, in accordance with NEMA TC2 and UL 651. Fittings shall conform to NEMA TC3.

Rigid steel conduit and couplings shall conform to ANSI C80.1, and UL 6.

Metal raceways shall have insulated throats and grounding bushings.

Liquidtight flexible steel is acceptable for offsets or where vibration is possible. Liquidtight flexible metallic conduit shall conform to UL 360.

HDPE raceway shall be SDR-11, smooth wall, pre-lubricated duct.

Install bell end fittings on conduits for all 12.47kV and 7.2 kV circuits terminating at riser poles, transformers.

Install conduit bushings on the end of each run of conduit (120/240 volt circuits, telephone and cable TV).

All empty conduit runs shall have a pull string with labels at each end and conduit caps.

On the trestle portion of the bridge, install conduit expansion joints on all conduits mounted in the conduit racks at each bridge expansion joint.

**662-2.15 GROUNDING AND BONDING.** Driven ground rods provide copper-clad steel ground rods conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length. Sectional type rods may be used for rods 20 feet or longer. Ground rod connections Grounding Conductors ASTM B 3.

Grounding conductor: Provide soft drawn copper wire ground conductors a minimum No. 4 AWG for utility pole, and as sized per drawings for Type 4 pull boxes. Ground wire protectors for pole installation shall be PVC.

Grounding connections shall be UL 467 using exothermic weld or compression connectors and shall be Ampact or hydraulic compression type – Burndy Hyground series or equal.

**662-2.16 WARNING TAPE.** Warning tape shall be 5 mil with metal backing, traceable Blackburn, Seton or equal. Install tape continuous in all trenches, thru manhole holes and splice boxes. Label tape based on the conduit system: "High Voltage 12.47kV", "120/240 Volt", "Telephone", "Cable TV"

**662-2.17 IDENTIFICATION TAGS.** Identification tags shall be non-magnetic, metallic bands embossed with circuit number, phase letter, conductor size and type, and installation date as specified by KPU. Branch circuit conductors shall have circuit numbers, Brady or equal.

All conductors, including those passing thru pull or junction boxes, shall be labelled with tags which identify where the conductors originate and terminate or their appropriate panel and circuit number, Brady, EZ Code or approved equal.

KPU will provide labelling for conductors at the riser poles; the Contractor shall install them.

Provide engraved, black plastic laminate labels for electric equipment. Labels shall have 1/4" high white lettering and shall be mechanically fastened: rivets or screws. Provide the following labels:

Panel A – (Lighting and Heat Tape): 120/240 volt, 1 phase, 3 wire service; Available short circuit = \*\* ; Panel is fed from Transformer X-3

Receptacles: panel name and circuit number

Street lights: stencil each pole with the pole number. Install label with the panel and circuit number in the handhole in the pole base.

All Nema and Pull Boxes: description of the contents within the box and provide circuit diagram.

Heat tape breakout boxes: Water Line Heat Tape, 120V Generator connection  
Heat Tape Pilot Light Switches: On/Off for Heat Tape run to breakout box near ## Water Street.  
End of Heat Tape Run: End of Heat Tape Run to Breakout Box located near ## Water Street

\*\* = after panel installation is complete contact the Engineer for the final value of the short circuit current.  
## = fill in street address nearest the box location.

Provide identification labels for the conduit in the conduit racks. Each conduit shall have the appropriate label on 100 foot centers. Labels shall be minimum black lettering 2" high, 9" long and shall be vinyl cloth with self-adhesive, Brady, Seton, LEM, Power First or equal. (Example "7200 volts Single Phase" Brady 44126 and 44129.) Provide the following labels for all conduits installed in the conduit racks under the bridge:

12.47kV, three phase  
7200 Volts, single phase

Elec Service to \*\* 120/240 volt  
Telephone service to \*\*  
Telephone distribution (to pedestals)  
Cable TV service to \*\*  
Cable TV distribution (to pedestals)

Street Lighting 240 volt  
Heat Tape 120 volt

Electric spare  
Telephone spare  
Cable TV spare

\*\* = street address of the service.

Where conduits penetrate concrete abutments, stencil the conduit identification on the abutment adjacent to each penetration.

Provide glow in the dark, 10"x14" aluminum warning sign at each padmount transformer location and panelboard location, Brady 40668, Seton, LEM, Power First or equal. Sign wording shall be: Danger Keep Out High Voltage. Mount the sign on the wood gate entering into the electrical equipment work area, facing the street.

Each new power pole shall have a KPU label with KPU ID number. Coordinate pole identification requirements with KPU.

Each new power pole shall have a KPU label with KPU ID number. Coordinate pole identification requirements with KPU.

**662-2.18 DEVICES.** Receptacles shall be commercial grade, grounding type, ivory colored, nylon face, side wired screw terminals, complete with matching coverplate.



1. Ground fault circuit interrupter receptacles installed outdoors and in wet locations shall be weather resistant. Hubbell GFTR20-I, Bryant, Leviton, Pass and Seymour or equal. Receptacles shall be installed with a self-closing weatherproof coverplate and box that meets the requirements of NEC 406.8, Red Dot - Code Keeper or equal. Install the weatherproof receptacle box in a Nema 4 enclosure with lockable hinged cover Hoffman stainless steel or equal.
2. Heat tape receptacle shall be a L5-20 flanged inlet (with male connectors) mounted in a weatherproof backbox complete with coverplate. The backbox and receptacle assembly shall be mounted in a Nema 4 heat tape breakout box per the drawings.
3. Heat tape generator connection. The City has a portable generator set which will be used to power the heat tape circuits and it has a 20 amp, 120 volt receptacle with GFCI protection installed on it. Confirm the receptacle's Nema configuration. Provide a twenty foot long, Type SO cordset (3#10 with ground wire), complete with mating Hubbell or equal connectors -one for the 20 amp heat tape flanged inlet receptacle mounted in the breakout box and the other end with a male plug for the generator connection. Coordinate the generator plug requirements with KPU Water Department.
4. Heat tape disconnects shall be manual pilot light switch (without overload relay), Nema 3R surface enclosure, non-reversing type, with toggle switch, pilot light, lockoff hasp and label. Switches shall be suitable for operation on 120 volt, single phase circuits, Square D Class 2510 KG1A, Cutler Hammer or equal. Install a heat tape disconnect switch for each heat tape. Type A indicating light shall be illuminated whenever power is available to the switch (heat tape energized).
5. Heat Tape Breakout box shall house the heat tape end seals, disconnects and receptacles. Boxes that contain heat tape receptacle, switch and power connection shall be a Nema 4X enclosure with lockable hinged cover, 16"X16"X8" with backpanel, Hoffman aluminum, stainless steel or equal. Boxes that contain only a heat tape end fitting shall be similar except 6"x6"x6".

**662-2.19 PANELBOARDS.** Panelboards shall be Nema 3R, size and type noted on the drawings. Panelboards shall have a ground bus, full height bussing to all the use of all available branch circuit space. Provide typed circuit directory for all panelboards; verify circuit loads. Panelboards shall be Square D Type NQ, Cutler Hammer or equal. Install each panelboard in a Nema 4X enclosure with lockable hinged cover, 60"X36"X12" with backpanel, Hoffman aluminum, stainless steel or equal.

**662-2.20 COMBINATION METER MAINS:** Combination meter main shall be self-contained type, surface mounted, raintight, Nema 3R, size as noted on the drawings and suitable for underground or overhead service entrance. Meter can shall have meter socket, sealing ring, suitable for 120/240 volt, single phase, three wire with circuit breaker sized per drawing, UL listed for service entrance. Equipment and installation shall meet the requirements of KPU. Combination meter main shall be Square D Class 4120 with type QO circuit breaker, B-Line Circle AW, Cutler Hamer, Milbank or equal.

**662-2.21 METER CENTER:** Meter center equipment shall be self-contained type, surface mounted, raintight, Nema 3R, size as noted on the drawings and suitable for underground entrance. Meter cans shall have meter socket, sealing ring, suitable for 120/240 volt, single phase, three wire with circuit breaker sized per drawing, UL listed for service entrance. Provide blanks, complete with sealing ring, for unused sockets. Equipment, including meter sockets (# of jaws, ring type), and installation shall meet the requirements of KPU Electric and shall have all necessary components for a complete installation.

Combination meter main shall be **Square D Class 4120 EZ Meter-Pak series** with type QO circuit breakers, B-Line Circle, Cutler Hamer Group Metering Commercial Stack, Milbank or equal.

**662-2.21 SERVICE DISCONNECT:** Disconnects shall provide overcurrent protection, circuit breaker type, raintight, Nema 3R, heavy duty, size and type as noted on the drawings, service entrance label, Square D Class 3110, Cutler Hammer or equal.

**662-2.22 BOXES AND ENCLOSURES:** Nema boxes used outdoors shall be Type 4, 16 gauge aluminum, stainless steel or fiberglass with butt hinges, lockable latch, ANSI gray finish, Hoffmann, Circle AW or equal. Box shall be sized for the equipment and wiring being installed in the box. Each box shall have a neat circuit diagram which shows all conductors in the circuit and all conductors that are routed thru the box.

**662-2.23 HANDHOLES.** Handholes shall be installed as shown on the drawings.

Type 1

Type:	DOT Standard L-23.01 Type 1 Handhole
Model:	15"x20"x12"D
Material:	Concrete
Lid:	(1) metal lid

Handhole shall have a traffic rated lid. Each box shall have a lid that is embossed with 'Electric'.

Install handhole with the long dimension parallel to the sidewalk and a pull string and label in each of the conduits located inside of the box.

**662-2.24 CONDUIT RACK.** Conduit rack shall be 12 gauge, 1-5/8" wide slotted channel, hot dip galvanized steel per ASTM 123, and as noted on the drawings. Zinc coating shall be minimum of 1.5 ounces per square foot, .0026" (2.6 mil) thick. Provide ASTM T316 stainless steel hardware and fittings, including clamps, hangers and brackets, for a complete the installation. Channel shall be Unistrut P1000 series, B-Line, Thomas & Betts, or equal.

**662-2.25 CONDUIT LADDER.** Conduit ladder shall be 12 gauge, 18" wide with 12" rung spacings, 4" side rails, 10 foot long, Nema VE-1 loading. Ladder shall be hot dip galvanized steel per ASTM 123, and as noted on the drawings. Zinc coating shall be minimum of 1.5 ounces per square foot, .0026" (2.6 mil) thick. Provide ASTM T316 stainless steel hardware and fittings, including clamps, hangers and brackets, for a complete the installation. Install ladder per Nema VE-2 standards. Conduit Ladder shall be B-Line 248-G-12 series, Unistrut, Thomas & Betts, or equal.

**662-3.01 CONSTRUCTION REQUIREMENTS.** Installation of power facilities shall be performed by craftsmen familiar with the work and shall conform to the requirements of NECA 1 Standard Practices for Good Workmanship in Electrical Contracting. The Contractor and electrical workers shall be licensed by the State of Alaska for the type of electrical work performed. Work procedures shall conform to OSHA regulations.

The installation requirements and testing procedures shall conform to RUS Bulletin 1728F-806 Specifications and Drawings for Underground Electric Distribution; RUS Bulletin 1728F-804, "Specifications and Drawings for 12.47/7.2 kV Line Construction; and RUS Bulletin 1728F-810, "Electric Transmission Specifications and Drawings, 24.6kV Through 69kV. In addition, installation of telecommunications systems including crossarms, pole, guys, etc. shall be installed per the RUS documents listed in specification 663.

LOCATION: KTN – Water Street: Rehabilitation / Replacement of Off System City Bridges  
Federal Project No: BR-000S(735)  
AKSAS Project No: 69534

**662-3.02 WOOD POLES.** Poles shall be placed at the locations shown on the Plans and Staking Sheets. Poles shall be handled with care when transported to the site. Any pole damaged by the Contractor shall be replaced. When distributing poles, extra heavy, choice, close-grained poles shall be reserved for angles, crossings and deadends.

The minimum depth for setting wood poles shall be as follows:

POLE LENGTH (ft)	SETTING DEPTH (ft)
25	5.0
30	5.5
35	6.0
40	6.0
45	6.5
50	7.0
55	7.5
60	8.0
65	8.5
70	9.0
75	9.5
80	10.0

Pole setting depth shall be measured from the finished grade at the station and offset shown in the Staking Sheets.

On sloping ground, the depth of the pole hole shall be measured from the low side of the hole. Pole holes shall be approximately 12 inches larger than the butt diameter of the pole and shall be at least as large at the bottom as at the top.

Only select native material that does not contain organic material shall be used for backfill. If necessary, three inch minus pit run gravel shall be substituted as backfill to replace unsuitable native material. Pole backfill shall be thoroughly tamped for the full depth and excess material shall be banked around the pole. After completion of the project, the backfill shall be inspected and any settlement refilled.

Poles shall be set so that alternate crossarm gains face in opposite directions, except at deadends where the gains of the last two poles shall be on the side facing the terminal or deadend. Where pole top brackets are used, they shall be located on the opposite side of the pole from the gain.

Poles shall be set in alignment and plumb except at line angles where they shall be set and raked against the strain. Angle poles shall be raked against the conductor strain not less than 1 inch per 10 feet of pole length or more than 2 inches per 10 feet of pole length after the conductors are installed at the required tension.

Where new gains or bolt holes are required in full length treated poles, the gains or holes shall be brush treated with two applications of the same type of preservative that was originally used to treat the poles. All unused holes shall be plugged prior to erection, using treated wood dowel pins. For newly bored holes or unused holes in existing poles, the holes shall be first treated with the preservative compound. Cutting the tops or butts of poles will not be permitted.

Coordinate the methods for using backhoes to install power poles with KPU.

**662-3.03 CROSSARMS AND APPURTENANCES.** Crossarms shall be installed so that they are level to the ground within a tolerance of 1 inch per ten feet. Crossarms shall be handled with care to avoid damage to the wood or preservative treatment. Crossarms shall not be field cut to length and any unused holes shall be plugged. Where new holes are required, the holes shall be brush treated with at least two applications of the same type preservative.

The required crossarm appurtenances are specified on the **KPU Construction Drawings**. Conductor spacings indicated on the structure outline and profile drawings shall be maintained. Pole through bolts shall be the proper size and length. When installed on the structure, through bolts shall extend at least ½ inch but not more than 2 inches beyond the nuts. Nuts shall be securely tightened. Lock nuts shall be installed on all bolts and threaded hardware. Lag screws shall be tightened with a wrench after driving.

The insulator assemblies are also specified on the **KPU Construction Drawings**. Care shall be exercised in handling and erecting the insulators. All insulators and attachment hardware shall be tight and all locknuts and cotter keys in place. The insulators shall be clean and free of contamination when installed.

**662-3.04 GUYS AND ANCHORS.** Guys and anchors shall be installed at the locations shown on the **Plans and Staking Sheets**. Points of attachment to the poles shall be as shown on the **KPU Construction Drawings**. Guys shall be installed before the conductors or telephone cables are strung. Where there is more than one guy, the tension on all strands shall be equalized. Guy guards shall be installed on all down guys.

All guys attached to poles carrying energized conductors shall include the size and type of guy insulator specified on the **KPU Construction Drawings**. Guy insulators shall be located so that the insulator will not be less than 8 feet above ground at any point when the guy sags or is broken.

All anchors shall be in line with the strain and shall be placed so that approximately 8 inches of the rod remains out of the ground. Where highway fill will cover existing anchor rods, anchor rod extensions of the same rod diameter shall be installed. Under no circumstances shall the eye of an anchor be covered.

Rock anchors shall be installed in accordance with **KPU Construction Drawings** where there is at least ten feet of solid rock. The diameter and depth of the drilled hole shall be as shown on the Drawings. A temporary plug shall be used to keep the hole from becoming fouled. Before the rod is placed, the hole shall be thoroughly cleaned of all chips and dust. Only the grout approved by the manufacturer shall be used and it shall be applied according to the manufacturer's instructions. The anchor hole shall be filled with grout to such a depth that when the rod is inserted, the hole will be completely filled. The rod shall be forced to the full depth of the anchor hole. Then the grout shall be allowed to set before placing tension on the rod.

Large capacity plate anchors shall be installed in accordance with **KPU Construction Drawings** where there is soil and fractured rock conditions. The anchor hole shall be dug as near to the anchor size as working conditions will permit. The trench for the anchor rod shall be dug so that most of the anchor plate will pull against undisturbed earth and in a straight line from the anchor to the point of attachment on the pole.

The first two feet of the backfill shall be broken rock not to exceed 6 inches in diameter. Where organic material is encountered, imported coarse crushed rock shall be used instead of the native material. The backfill of all anchor holes shall be compacted to 90% of the surrounding material and surplus material spread over the top of the hole.

**662-3.05 CONDUCTORS.** Mainline conductors shall be installed by the tension stringing method in accordance with ANSI/IEEE 524. **ENERGIZED LINE WORK WILL BE REQUIRED!** The Contractor shall have the necessary qualifications and equipment to safely work in the vicinity of energized conductors. Furthermore, the Contractor shall be responsible for any associated temporary construction essential for the safety of the public, such as the installation of guard structures at highway crossings.

Conductors shall be handled with care to avoid kinking, twisting or abrading the conductor in any manner. The wire on each reel shall be inspected for cuts, kinks or other injuries. Injured portions or crooked or imperfect splices shall be cut out and the wire respliced. No splice shall be located closer than 15 feet from a pin support, 100 feet from a deadend support or in any span which crosses the highway. More than one splice in a span will not be permitted.

The conductors shall be pulled over suitable rollers or stringing blocks properly mounted on the pole or crossarm to prevent binding while stringing. Conductor contact with any abrasive object will not be permitted. Guards shall be provided where there is a danger that the conductor may be damaged by vehicles or equipment.

Neoprene lined (or approved equal) double bull wheel type tension stringing equipment shall be used to install conductors by the tension stringing method. This equipment shall be capable of maintaining preset tensions and pulling speeds. Sufficient continuous tension shall be maintained to keep the conductors clear of obstructions that could damage the conductor. Sheaves shall be designed and used so that the pulling line does not damage the sheaves or deposit foreign matter in the liner that could damage the conductor.

The maximum pulling tensions shall not exceed 110% final sag tension. The slope of the conductor between the tension machine and stringing blocks at the first structure shall not be steeper than three horizontal to one vertical. If the conductor is left in the stringing blocks for longer than 18 hours, the conductor shall be left at reduced tension. The length of conductor pulled in one operation shall be limited to the length of conductor that can be sagged satisfactorily.

Conductors shall be sagged by the return wave method or by sighting between targets using stringing sag charts provided for each conductor size. The sag of all conductors after stringing shall conform to the conductor manufacturer's recommendations, except that a maximum increase of 3 inches over the specified sag in any span will be acceptable if required clearances are maintained. Under no circumstances shall a decrease in the specified sag or conductors that are unevenly sagged be allowed. The sag shall be checked at each end of a long pulling section and on both sides of angles greater than 10 degrees.

A certified etched glass thermometer shall be used to determine the air temperature at the time and place of stringing operations. The temperature, sag and location of the span where the sag was recorded shall be recorded and the information given to the Engineer.

Conductors in a pulling section shall be clipped in starting from the forward end of the pull. Armor rod shall be installed where required on the KPU Construction Drawings. With pin type insulators, the conductors shall be clamped in the top groove of the insulator in accordance with the manufacturer's instructions. With post type insulators, the conductors shall be fastened in the trunnion clamps and torqued in accordance with the manufacturer's instructions. Pin type insulators shall be tight on the pins and the top groove must be in line with the conductor.

All conductors shall be cleaned thoroughly by wire brushing before splicing or installing connectors or clamps. A suitable corrosion inhibitor shall be used before splicing or applying connectors over aluminum



conductors. Splices and connectors shall be installed strictly in accordance with the manufacturer's instructions. The compression shall be carefully controlled so the completed splice is as straight as possible. After the compression is completed, all corners and sharp projections shall be carefully rounded and smoothed. No splices shall be located less than 15 feet from the conductor support and only one splice is permitted in each conductor per span.

Jumpers and other leads connected to line conductors shall be formed with sufficient slack to allow free movement of the conductors. Sufficient slack shall be provided by at least two bends in the vertical plane or by one bend in the horizontal plane, or the equivalent. All jumpers shall meet the clearance requirements of the NESC. Only one compression connector per jumper will be allowed.

Connectors shall be the type indicated on the KPU Construction Drawings. The contact surfaces shall be brushed clean and bright. Compression connectors shall be installed with the proper die; bolted connectors shall be torqued to specifications.

**662-3.06 GROUNDING.** A butt plate or driven ground rod shall be installed at all primary pole locations. The type of ground to be used at each location is provided in the **KPU Construction Drawings** and the U Sheets. A driven ground rod shall be installed at all transformer poles and at least every 1000 feet. Ground rods shall be driven full length in undisturbed earth and shall be at least 12 inches below the surface of the earth. The rod shall be connected with an approved clamp. Butt plate grounds and ground wires shall be secured to the pole with staples. The ground wire staples shall be spaced 2 feet apart, except within 8 feet above the ground the spacing shall 1 foot apart. Approved bi-metallic connectors shall be used to connect the ground wire to the multigrounded system neutral. Equipment grounds, neutral wires and surge arresters shall be attached and bonded to the common ground wire on each pole.

- A. All raceways and electrical equipment shall be bonded and grounded as required by the NEC and NESC. The NEC shall be used for work downstream of the KPU meter base. The NESC shall be used for work upstream of the KPU meter base.
- B. All clamps, lugs, bushings and similar devices used for grounding and bonding shall be approved for the purpose. Bond together all non-energized metal surfaces of the electrical system (receptacle grounds, grounding conductors, raceways, equipment enclosures, etc.) Effectively ground the electrical system per the drawings.
- B. All raceways entering service equipment, distribution and panel enclosures, electrical equipment cabinets thru knockouts or reducing washers shall use insulated throat with grounding bushings. Grounding bushings shall be OZ Gedney BLG or HBLG series or equal.
- C. Provide a green equipment grounding conductor in all feeder circuits downstream of the meter base and branch circuits. Terminate each end on a suitable bus or lug.
- D. Take photographs of all concealed and buried grounding connections including conductor routes. Place photographs in the O/M manual complete with descriptions of each photo and field dimension locating the equipment.
- E. Measure the ground resistance between system neutral and ground reference point. Provide a parallel ground rod if resistance exceeds 25 ohms.

**662-3.07 FREE STANDING POLES.** Free standing poles shall be metal; burial depth and foundation design shall be by the manufacturer.



**662-3.08 DISTRIBUTION TRANSFORMERS.** The distribution transformers shall be installed in accordance with the **KPU Construction Drawings**. All conventional transformers shall be protected with an external fuse. The fuse size and type shall conform to KPU requirements. Transformer tanks shall have at least two connections from the tank and neutral bushing to the multigrounded neutral conductor. Adjust taps on padmount transformers to meet KPU system voltage requirements.

Where required, a bimetallic connector shall be used to terminate aluminum service conductors. On three phase banks, neutral jumpers shall be equivalent in size to the phase conductors.

**662-3.09 SECONDARIES - SERVICE LATERALS AND DROPS.** Secondary and service cables shall be installed and terminated according to the plans and the **KPU Construction Drawings**. All overhead secondary and service cables, with the exception of the common neutral, shall be triplexed or quadruplexed insulated aluminum conductors. All underground service laterals shall be insulated aluminum conductors with Type X insulation. The conductor sizes should conform to KPU Standards. The overhead cables shall be sagged in accordance with the manufacturer's instructions.

Secondary and service cables shall be arranged so as to not obstruct climbing space. Existing service drops may be spliced but there shall not be more than one splice per conductor in any span. Splices shall be located at least 10 feet from the cable support.

**662-3.10 PULL BOXES.** Install boxes flush with finish grade, out of traffic areas. Wherever possible install the box with the long side parallel to roadway or the back curb of the sidewalk. Where boxes are installed in sidewalks install a ½" bituminous joint sealer around its perimeter. Each box shall have a neat circuit diagram which shows the complete circuit that is routed thru the box.

Install Type 1 boxes on minimum of 18" of course aggregate bedding and the top of the box flush with the final finished surface. Terminate conduits 5" above the bottom of the box. Tie the conduit grounding bushing to metal cover.

Install boxes flush with finish grade, out of traffic areas. Wherever possible install the box with the long side parallel to roadway or the back curb of the sidewalk. Where boxes are installed in sidewalks install a ½" bituminous joint sealer around its perimeter. Each box shall have a neat circuit diagram which shows the complete circuit that is routed thru the box.

**662-3.11 CONDUIT SUPPORT.** Conduit support, including conduit racks and conduit ladders, shall comply with Nema 1 and Nema 101 installation methods. Assemblies shall be sized to carry a minimum static design load of the supported components plus 200 pounds. The minimum rod hanger size shall be ¼" (6mm) diameter.

- A. Installation shall meet seismic restraint and anchorage requirements.
- B. Fastening to the bridge deck: no field installed fasteners, drilled or shot into the deck are allowed. All fasteners shall be inserts installed by the bridge deck manufacturer. Contractor shall coordinate all insert locations with the bridge deck manufacturer during the submittal phase.
- C. Fastening to nonstructural building surfaces: Mount panelboards, pull boxes, devices such as receptacle backboxes, and combination meters to slotted channel attached with mounting stainless steel bolts and hardware suitable for the substrate.
- D. Clean all field cuts, chips in factory applied finishes, and abraded areas. Paint effected areas with galvanizing repair paint complying with ASTM A780.

**662-3.12 CUTOVER AND ENERGIZATION.** The Contractor shall coordinate cutover and energization of each realignment section with KPU in accordance with the approved service interruption and switching plan. The Contractor and KPU Electric Division personnel shall mutually inspect each realignment section prior to energization and develop written list of deficiencies that need to be corrected. The Contractor shall correct these deficiencies before cutover and energization and remove all temporary facilities. Cutover and energization of each realignment section shall occur during an off peak period to minimize the disturbance to KPU consumers.

**662-3.13 DEMOLITION.** After cutover and energization, the Contractor shall wreckout unused segments of the Water Street overhead distribution system noted on the plans. Old poles and anchors shall be removed or cut off below the ground line and covered with soil. Wire shall be neatly coiled for scrap. Any surplus materials that the utilities want to retain shall be stockpiled and delivered to their storage yard. All other surplus materials of no value shall be disposed of in an approved manner. Install concrete patch to the roadway or sidewalk where pole has been removed.

After the demolition is complete, the Contractor shall cleanup all facilities and staging areas used during construction. All equipment, temporary structures, surplus material and trash shall be removed from the sites and disposed of in an acceptable manner.

**662-4.01 METHOD OF MEASUREMENT.** No measurement for payment will be made.

**662-5.01 BASIS OF PAYMENT.** The Contractor shall accept the bid amount for a lump sum item as complete payment to furnish and install, complete and accepted in place.

The 662(1) Power Distribution Systems Construction pay item is for the labor and materials associated with the following:

All the work shown on U sheets and in specification 662 except the work associated with 662(2) and 662(3).

The 662(2) Power Distribution Systems pay item is for the labor and materials associated with the work involved in installing conduit systems for the following KPU Telecommunication items:

Revising Parnell VDSL cabinet installation: including conduits, demolition of Pole 10T  
Under bridge conduit distribution system from Poles P10 to P1 and to the Utility Pads 1-4.  
Under bridge service conduits run from Utility Pads 1-4 to the home.  
(The cabling and ONT installation associated with the above conduit systems is performed under Section 663.)

The 662(3) Power Distribution Systems pay item is for the labor and materials associated with the work involved in installing conduit systems for the following GCI items:

Under bridge conduit distribution system from Poles P10 to P1 and to the Utility Pads 1-4.  
Under bridge service conduits run from Utility Pads 1-4 to the home.  
(The cabling and NID installation associated with the 662(3) conduit systems is performed by GCI.)

<b>Pay Item</b>	<b>Pay Unit</b>
662(1) Power Distribution Systems Construction	Lump Sum
662(2) Power Distribution Systems Construction - KPU Telecomm raceways:	Lump Sum
662(3) Power Distribution Systems Construction - GCI raceways:	Lump Sum

Add the following Section:

## SECTION 663

### TELECOMMUNICATIONS

**663-1.01 DESCRIPTION.** Furnish and install, transfer, modify, or remove aerial telecommunication facilities consisting of copper and fiber optic cables.

Where an existing system is to be transferred, reuse the existing material in the revised system as shown on the Plans.

**663-1.02 PLANS, STANDARD DRAWINGS AND DETAILS.** The scope of work is described in detail in the following plans and specifications:

LOCATION	TITLE	SHEETS/PAGES
V1-V16	Telephone Cable Layout (Plans)	16
V20-V25	Cable TV Layout	6

The Contractor shall keep a redlined set of complete record copy plans and specifications. These plans shall record all construction assemblies and correct any changes or discrepancies. Three (3) copies of record copy plans shall be furnished following completion of the work.

**663-1.03 REGULATIONS AND CODES.** All construction work shall be done in a thorough and workmanlike manner in accordance with the Plans and Specifications. The latest edition of the National Electrical Safety Code (NESC) and National Electric Code (NEC) shall be followed except where local regulations are more stringent, in which case local regulations shall govern.

**663-2.01 MATERIALS.** The Contractor shall be responsible to provide materials that conform to **KPU Telecommunications Standards** and are suitable for the specified service. The Contractor also shall comply with the requirements of 23 CFR 635.410, Buy America Requirements, and shall submit a completed Material Origin Certificate, Form 25D-60, prior to award of the contract.

1. Equipment List(s) and Drawings. Within 30 days after the Contract award, submit 4 collated copies of a portfolio of equipment and materials proposed for installation to the Department for review and approval. Include a table of contents in the portfolio(s) that includes each item's intended use(s) and the following:

- a. Materials: A description that includes product name, manufacturer, model or part number, type of product, size, model number, conformance specifications, and other data as may be required.
- b. Materials Not Requiring Certification: Incidental materials incorporated into the work (such as nuts, ties, bolts, washers, etc.) must meet all applicable Specifications and be installed per all manufacturer's recommendations. Certification is not needed unless required by the Special Provisions or requested by the Engineer.

2. As-Built Plans. Prepare 3 complete sets of red lined as-built plans and keep them current with the construction. Detail in the as-built plans all construction changes made to the Plans. Include the following information on the appropriate sheets:

- a. Location of cabling runs
- b. Station and offset of all poles
- c. A list of splice location and termination equipment

Before final inspection of the work, submit 3 complete sets of as-built plans to the Engineer.

3. Warranties, Guarantees, and Instruction Sheets. Deliver to the Engineer all manufacturers' warranties, guaranties, instruction sheets, and parts furnished with materials used in the work before KPU assumes maintenance responsibilities.

**663-2.02 CROSSARMS.** Wood crossarms shall be full length pressure treated solid sawn Douglas Fir timbers. The cross sectional dimensions and length of each crossarm shall conform to the KPU Telecommunications Standard Drawing.

All wood crossarms furnished for the project shall meet the requirements of ANSI Standards 05.2 and 05.3, Rural Utility Service (RUS) Specification 1728H-701 as well as to the provision of Select Structural as described in the Standard Grading Rules for West Coast Lumber. Crossarms shall be predrilled prior to treatment for the structure configurations in the KPU Telecommunications Construction Drawings.

The Douglas Fir crossarms shall be pressure treated with oil borne pentachlorophenol in accordance with AWP Standard C25-92 (Solid Sawn) or C28-91 (Glue Laminated). The retention level of pentachlorophenol shall not be less than 0.4 pounds per cubic foot.

Crossarms shall be bundled and protected from damage during shipment.

**663-2.03 COPPER CABLES.** Filled Solid Cables conforming to Rural Development Utilities Programs (RDUP) PE-89 shall be used. In addition, the plastic jacket shall be marked with identifying information including the cable code, pair count, American Wire Gauge (AWG), date of manufacture, and sequential length markings at 2-foot intervals. The number of pairs and gauge size of the conductors which are specified for this project are shown below:

<u>Pair Count</u>	<u>AWG (mm)</u>	<u>Basis of Design</u>
25	24	Superior Essex GOPIC-F
		Superior Essex GOPIC-F
Service Drop to the Home (6 pair)	22	Superior Essex ADPNMS

The 200 pair is routed in existing conduit #3 per drawing V19 from manhole 18 to the pole at the top of the stairs on Millar.

**663-2.04 COPPER CABLES.** Air Core Cable conforming to Rural Development Utilities Programs (RDUP) PE-22 shall be used. In addition, the plastic jacket shall be marked with identifying information including the cable code, pair count, American Wire Gauge (AWG), date of manufacture, and sequential length markings at 2-foot intervals. The number of pairs and gauge size of the conductors which are specified for this project are shown below:

<u>Pair Count</u>	<u>AWG (mm)</u>	<u>Basis of Design</u>
900	24	Superior Essex SEALPic

**663-2.05 COPPER CABLE SPLICE CLOSURES.** Use aluminum type closures for underground/aerial installations that are an in-line type for main and distribution splices. The closures shall be capable of holding up to 900 to pairs AWG 24, Armadillo Coyote or equal. All copper cable splices shall be properly bonded. The splice closures including the bonding method shall conform to KPU's Standards, RUS Specification 1755, and be suitable for the specified service.

**663-2.06 OPTIC CABLES.** Loose tube indoor/outdoor Optical Fiber, Nonconductive, Riser (OFNR) conforming to RUS 1755.900 and loose tube, single jacket, single armor optical fiber cables conforming to RUS PE-90 shall be used for the 36 strand fiber. The types and counts of the optical fiber cables which are specified for this project are shown below:

<u>Type</u>	<u>Basis of Design</u>
Loose Tube Single Jacket, Single Armor 36 strand, single mode	Corning Series 12
Long Tail Terminal	Corning MTB; Tyco FTRM
Fiber Drops to homes & Parnell VDSL Cabinet 1, 2, and 4 strand, SST drop	Corning OPTI-TAP Assemblies; Tyco Hardened Drop Cables

See Sheet V02 for additional information on cables and drops.

**663-2.08 OPTIC CABLE SPLICE CLOSURES.** Use mechanical closures for aerial installations of Loose Tube Fiber Optic Cables. The closures shall be a butt-type with gel cable sealing technology and have baskets and trays capable of holding up to at least 360 count fiber, Corning SCF series, Tyco FOSC, or equal. The splice closures shall conform to KPU's Standards, RUS Specification 1755, and be suitable for the specified service. Optic cable splice enclosure shall be similar except shall have a long tail, length as specified on the drawings.

**663-2.09 FIBER TERMINALS.** The terminals shall have number of ports as listed on sheet V02, and installed in pedestal mounted on the utility pad.

be a butt-type with gel cable sealing technology and have baskets and trays capable of holding up to 144 count fiber, Corning SCF series, Tyco FOSC, or equal. The splice closures shall conform to KPU's Standards, RUS Specification 1755, and be suitable for the specified service.

Optic cable splice enclosure shall be similar except shall have a long tail, length as specified on the drawings.

**663-2.10 STRAND.** Strand shall be 16 M with a 16000 lb. breaking load and 6 M with a 6000 lb. breaking load as shown on the plans and shall conform to the requirements of ASTM B415 and B416.

**663-2.11 HARDWARE.** The Contractor shall furnish the materials specified on the KPU Telecommunications Standard Drawings, Plans and Crossarm Details. These documents are available for viewing in the KPU Telecommunications engineering office. Hardware material shall all meet the requirements of materials per the appropriate RUS Specifications and KPU material inventory lists.

**663-2.12 AIR PIPE ½" HDPE TUBING.** Air pipe shall have an armor of 6 mil aluminum, coated with polymer on both sides, longitudinally applied with a 1/8" overlap. Its outer jacket shall be black high-density polyethylene (HDPE) and must be tested per Telcordia Standards.

1. Provide fittings to connect the air pipe at the locations shown on the drawings .
2. Provide control devices and modify existing control system as required to make a fully functional system. Coordinate requirements with KPU.
3. Provide hardware for central office equipment; coordinate with KPU for product requirements.

**663-2.13 Fiber Optic ONT for service entrance/demarcation at the home.** Existing ONTs with overhead fiber drops have been installed on the homes in the project work area (see V sheets for locations). The ONTs are based on the following:

<u>Type</u>	<u>Basis of Design</u>
ONT Total Access 354E	ADTRAN ONT



The work shall connect a new underground service to the existing ONT. After the new underground system is operational, the existing overhead service drops shall be demolished. Coordinate service switchover with KPU Telecommunications.

**663-2.14 PEDESTALS.** Pedestals shall be 30" high fiberglass, house the fiber terminations, complete with mounting base, Channel, Emerson ProForm FTTP PRO10 series or equal. Provide a hot dipped galvanized mounting bracket suitable to secure all four sides of the pedestal base to a concrete slab. Each pedestal shall have a fiber terminal mounted in it; see Sheet V02.

**663-2.15 ADTRAN VDSL TA5000.** An existing Adtran VDSL Total Access TA5000 system has been installed at Parnell Street in a previous contract. The existing installation has the following items:

QTY	UNIT	Material Code	DESCRIPTION
1	EA	4192A5K504L1	Adtran TA5000 Cabinet System (Cabinet & Cards)
21	EA	11871201.1	A5000 Combo V2 24 Port Access (Cards only - 21 for Parnell)
2	EA	1187025G1	TA 5000 Switch Matrix W/O Ring
1	EA	1187010G2	TA5000 SCM G2
2	EA	1442910G1	XFP 10G 1310NM 10KM
1	EA	11909021.1	Pad Mount Kit MC21 0 EB
1000	EA	3B1E	Module Protector
6	EA	V1000A-VC	Rectifier V series 48V 20AMP DC
8	EA	SBS190F	Battery Single SBS 190F 12V

Modify the electrical service drop, telephone copper and fiber cabling to the VDSL cabinet as shown on the drawings. After new Pole P10 is installed and operational, remove the existing abandoned KPU cables from existing Poles P10 and P10T. Demolition of existing Poles P10 and P10T shall be provided in Section 662.

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**663-2.16 FABRIC MESH INNERDUCT.** Fabric mesh innerduct shall have three mesh pathways in a single pack; each pathway shall be sized for a one inch diameter cable, prelubricated, MaxCell or equal.

### **663-3.01 CONSTRUCTION REQUIREMENTS.**

- 1. Qualifications.** The Contractor and craftsmen shall have the appropriate licenses and certifications required by the State of Alaska for outside telecommunications plant construction. Documentation of a minimum of five (5) years experience for telephone lineman is required. Contractors shall submit a Telecommunications Bidder Experience Record that documents each contract employee's experience with telephone aerial copper and fiber optic cable splicing and pole line construction.
- 2. Scheduling of Work.** The telecommunications work shall be sequenced with the power work and highway construction. The Contractor shall provide a work schedule to the Department and affected utilities for approval.
- 3. Service Interruptions and Switching.** No consumer shall be placed out of service without the advance permission of KPU Telecommunications. Consumers shall be exposed to a minimum number of outages and those outages shall be limited to the transfer from an existing facility to the new facility. The Contractor shall obtain an approval from KPU Telecommunications and shall notify the consumers individually prior to any outage. KPU requires a minimum of two weeks before a scheduled outage to notify their customers.

The Contractor shall submit a service interruption plan to KPU Telecommunications and DOT&PF. Approval of the proposed plan must be obtained from KPU Telecommunications and DOT&PF prior to commencing work.

4. Temporary or Incidental Construction. The Contractor shall provide any temporary or incidental construction necessary to complete the work in a timely manner in accordance with the approved work schedule.
5. Easements. Construction activities shall be limited to within the Department's easements or rights-of-way boundaries. Only activities specified in the terms of the easements shall be permitted and the Contractor shall restore the property to the original condition or as directed by the Engineer.
6. Surplus Material. Surplus material in good condition shall be reasonably protected and returned to the utility. Surplus material of no value shall be removed from the Department's right-of-way by the Contractor and discarded in an approved manner.
7. Material Handling. Handling and placement of facilities shall be in accordance with Rural Utilities Service (RUS) Specifications and Drawings for Construction of Aerial Plant Bulletin 1753F-152.

**663-3.02 CROSSARMS.** The Contractor shall install the communications crossarms at the specified spacing from the power facilities. Crossarms shall be installed level to the horizon with a tolerance of 1 inch per ten feet. Crossarms shall be handled with care to avoid damage to the wood or preservative treatment. Crossarms shall not be field cut to length and any unused holes shall be plugged. Where new holes are required, the holes shall be brush treated with at least two applications of the same type preservative.

The required crossarm appurtenances are specified on the Crossarm Details. Conductor spacings indicated on the structure outline and profile drawings shall be maintained. Pole through bolts shall be the proper size and length. Through bolts shall extend at least ½ inch but not more than 2 inches beyond the nuts when installed on the structure. Nuts shall be securely tightened. Lock nuts shall be installed on all bolts and threaded hardware. Lag screws shall be tightened with a wrench after driving.

**663-3.03 COPPER AND OPTIC CABLES, STRAND AND HARDWARE.** All cables and hardware shall be installed in accordance with RUS Bulletin 1751F-635.

**663-3.04 SPLICING.** Splicing for copper cable and fiber optic cable shall be in accordance with RUS Splicing Standard Bulletin 1753F-401 (PC-2). Complete all shield and jacket bonding, grounding and testing in accordance with RUS Bulletin 1753F-401 (PC-2).

**663-3.05 Testing.** Inspect and test all cable conductors in accordance with requirements described in RUS Form 515, "Telecommunications System Construction Contract", Article V and RUS Standard for Acceptance Tests and Measurements of Telecommunications Plant (PC-4), and RUS Splicing Standard Bulletin 1753F-401 (PC-2).

**663-4.01 METHOD OF MEASUREMENT.** No measurement for payment will be made.

**663-5.01 BASIS OF PAYMENT.** The 663(1) Telecommunications Construction pay item is for all work shown on the Plans (V sheets) related to Telecommunications Construction; in general this work is to install cabling, pedestals, NIDs and all terminations for KPU Telecommunications infrastructure. The work as shown on the U sheets associated with KPU Telecommunications, such as telecommunications raceway systems, demolition of pole P10T, guys and strand for the overhead distribution telecommunication system are work that associated with 662(2).

PAY ITEM	PAY UNIT
663(1) Telecommunications Construction	Lump Sum

Add the following new section:

**SECTION 675  
INLET STRUCTURE FABRICATIONS**

**675-1.01 DESCRIPTION.:** This item of work shall consist of furnishing, fabrication and installation of the custom steel storm drain inlet structure on the trestle.

Inlet Structure Type 1 are set in the pre-cast concrete deck panels.  
Inlet Structure Type 2 are set over a standard catch basin.

**675-2.01 MATERIALS.** Use materials that conform to the following:

Structural Steel Plates	ASTM A 709 Grade 36 Section 716
Steel Grate	Grey Iron      ASTM-A-48 Class 35 B

All components of the inlet structure, except the cast grate shall be hot dip galvanized after fabrication per AASHTO M111.

**CONSTRUCTION REQUIREMENTS**

**675-3.01 SUBMITTALS.**

Submit to the Engineer for review shop drawings for each unit.

The plans at a minimum the plan should include the following information:

- Material type and certificates
- Fabricated dimensions
- Welding procedures
- Grate details
- Total weight

Submit mockup trial fit report.

**675-3.02 FABRICATION**

Steel Grate. Neenah Foundry R-3504-F Grate only, the lower frame is not required.

Welding. Per Section 504-3.01 paragraph 8.

Mock Up. Fabricate one full unit with grate to confirm fit up of the full assembly prior to fabrication of remainder of the units. Submit to the Engineer a mock up report for review with photos and details from mock up trial fit. Confirm any dimension or fabrication detail modifications with the Engineer prior to fabrication of the remaining units.

Assembly. Each unit with the cast iron grate shall be assembled for a "fit up" check after galvanizing.

Shipping. Each inlet structure shall be shipped as a unit with the cast iron upper grate and lower steel fabricated box together.

**675-4.01 METHOD OF MEASUREMENT**

Inlet Structure \_\_\_\_\_ will be paid per each full unit installed.

#### **675-5.01 BASIS OF PAYMENT**

The contract unit price for "Inlet Structure \_\_\_\_\_" shall include all costs for labor, materials, tools and equipment necessary to fabricate, galvanize, install and grout the steel inlet structure as shown on the plans. Each unit shall include the lower steel fabricated box and the cast steel grate insert.

Included shall be the cost for all shop drawing preparation and review.

Fabrication and materials for the lower concrete structure will be paid for under "Class A Concrete".

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
675(1a) Inlet Structure (Type 1)	Each
675(1b) Inlet Structure (Type 2)	Each